

Host Status of Citrus to Reniform Nematodes¹

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INTRODUCTION: The reniform nematode, *Rotylenchulus reniformis* Linford & Oliveira, has a wide host range. More than 170 dicot and 25 monocot hosts are listed in the literature (Caswell-Chen and Robinson 1996). This host list also includes citrus. More than 70 papers report reniform nematodes on citrus since 1956. Peacock in 1956, found for the first time *R. reniformis* parasitizing rough lemon [*Citrus jambhiri* Lush. (often cited as *Citrus limon* (L.) Burm. f.)] roots in the Gold Coast (Ghana, West Africa). Following this report, the nematode was found associated with citrus roots in other tropical and subtropical localities which include Bermuda, Brazil, Brunei, Costa Rica, Cuba, Egypt, Florida, French West Indies, Greece, Honduras, India, Iraq, Jamaica, Louisiana, Peru, Puerto Rico, Taiwan, Thailand, and Venezuela (Perry *et al.* 1962; Sharma and Sher 1973; Siddiqi 1972; Tarjan 1967; Stoyanov 1971; Tarjan 1964b; Malo and Tarjan 1968; Kermarrec and Scotto La Massese 1969; Hirschmann *et al.* 1966; Pinochet *et al.* 1978; Siddiqi 1972; Mohammad *et al.* 1981; Dixon and Latta 1961; Fielding and Hollis 1956; Sasser *et al.* 1962; Ayala and Ramirez 1964; Hung 1969; Timm 1965; and Loof 1964). Because of this large amount of literature concerning reniform nematodes on citrus, regulatory agencies of the state of California have included *R. reniformis* in the list of citrus pests subjected to quarantine (Department of Food and Agriculture of California

1995). Unfortunately, in spite of the numerous papers published on this subject, there is no information about *R. reniformis* densities and reproduction rates on citrus roots. The papers listed above do not provide assessment of nematode densities in the roots and deal only with soil densities of reniform nematodes. Furthermore, some authors involved in reniform surveys on citrus, (e.g., Tarjan 1964a) who reported association of *R. reniformis* with citrus from several geographical areas from Florida to Central America and Egypt,

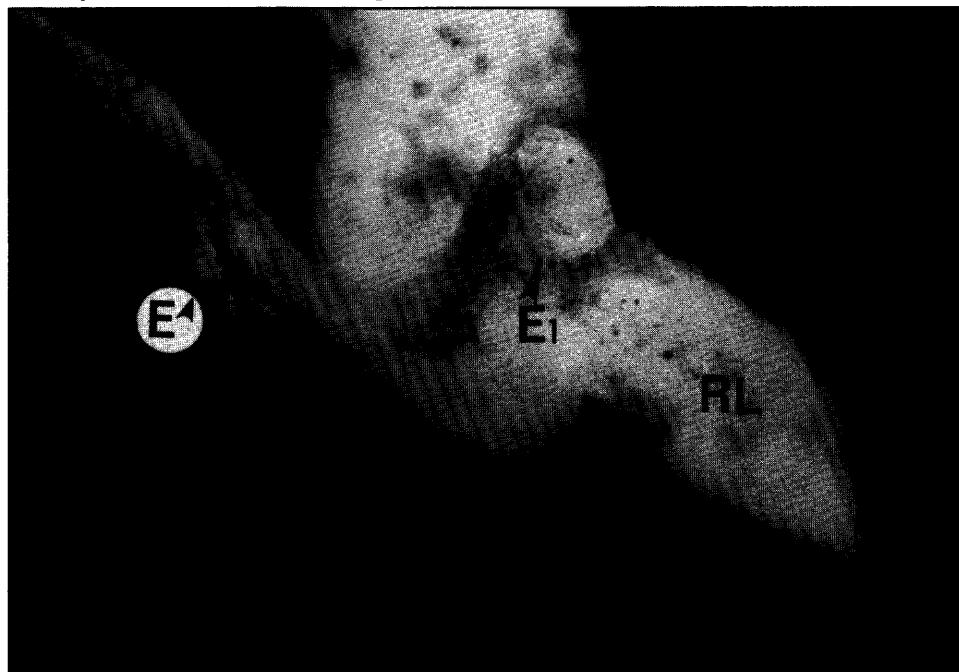


Fig. 1. A rough lemon (RL) fibrous root associated with a cowpea (CP) rootlet infected by two egg masses (E) of *Rotylenchulus reniformis*. Note nematode egg mass (E1) adhering to both cowpea and rough lemon roots making host identification very difficult without proper root separation. Scale bar = 240 μ m. Technical assistance: Amie Smith, Jeffery W. Lotz and Ross McClain.

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doubted that the roots of citrus surveyed were infected by *R. reniformis*. We are reporting the results of studies to determine the host status of citrus to reniform nematodes.

HOST TEST AND SURVEY: *R. reniformis* from South Florida failed to infect roots of rough lemon seedlings after a nine month-exposure to initial nematode densities of 15 nematodes per cc of soil in host tests conducted from 1994-1995 in a greenhouse of the division in Gainesville. Final nematode densities decreased to six specimens per cc of soil in the pots with rough lemon seedlings. In contrast, final nematode levels in the control pots with cowpea (*Vigna unguiculata* (L.) Walp.), a good host of the nematode, increased to 20 specimens per cc of soil (Inserra and Duncan, unpublished). A few egg masses of *R. reniformis* were observed apparently on rough lemon roots from pots where this citrus rootstock was grown in combination with cowpea, providing the impression that the nematode was parasitizing the rough lemon roots. However, careful separation of these egg masses from the citrus roots revealed that the egg masses originated from small cowpea roots adhering to the citrus roots (Fig. 1).

During the past thirty years, citrus groves have been occasionally planted in soils infested by *R. reniformis* in the Rio Grande Valley of Texas. Examinations of sour orange (*C. aurantium* L.) roots from these orchards were consistently negative for *R. reniformis* parasitization (C. Heald, unpublished). Furthermore, *R. reniformis* has never been reported from citrus in Hawaii despite widespread occurrence of the nematode in Hawaiian soils. The results of the host test in Florida and the lack of evidence of *R. reniformis* reproduction on citrus in Texas and in Hawaii indicate that *R. reniformis* does not infect citrus in the United States (Arizona and California are free of *R. reniformis*).

SOURCES OF *R. RENIFORMIS* INFESTATIONS IN CITRUS ORCHARDS: It is well known that *R. reniformis* parasitizes several weed hosts (about 20 weed species are listed as hosts of the nematode in Florida, Inserra *et al.* 1989). The occurrence of *R. reniformis* on weeds in citrus and other fruit orchards in South Florida is very common. Soil samples from these orchards are positive for *R. reniformis* because it originates from weed roots and contaminates soil particles surrounding the citrus rhizosphere. Only a careful examination and separation of the roots in samples provides certainty of the origin of the nematode infestation. Unfortunately, root examination of soil samples is often omitted in nematode surveys because it is difficult and time consuming. Therefore, *R. reniformis* nematode surveys based only on the nematological analysis of soil provide only an indication of nematode presence, but not of hosts.

CONCLUSION: In spite of the lack of evidence of citrus root parasitization by *R. reniformis* in the United States and also in the Caribbean Basin (Tarjan 1964a), we cannot exclude the possibility that populations of *R. reniformis* able to attack citrus exist in other parts of the world. However, the report by Peacock (1956) relative to rough lemon root parasitization in Ghana, West Africa needs further confirmation. Several other reports from India, where mandarin (*C. reticulata* Blanco) roots were presumably found infected by *R. reniformis* (Ganguly 1988) should also be verified because the data published deal only with soil nematode densities without providing any information about root infection. Other species of the genus *Rotylenchulus* reported on citrus are *R. borealis* Loof and Oostenbrink and *R. macrodoratus* Dasgupta, Raski and Sher (Bello 1972; Talamé *et al.* 1970). Similarly, no evidence of root parasitization by these two nematodes was provided. Data published in the literature so far do not provide sufficient evidence to consider *Citrus* spp. as host plants for reniform nematode parasitization.

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